

B.Sc. ELECTRONICS
Third Semester
SIGNALS AND SYSTEMS
(BSE - 303)

Duration: 3Hrs.

Full Marks: 70

Part-A (Objective) =20
Part-B (Descriptive) =50

(PART-B: Descriptive)

Duration: 2 hrs. 40 mins.

Marks: 50

Answer any four from Question no. 2 to 8
Question no. 1 is compulsory.

1. (a) Find the step and impulse response of series R-C circuit.

(b) Define filter. Write various types of filters with their characteristic curves.

(6+4=10)

2. (a) Check whether the following systems are

i) Static

ii) Linear or non linear

iii) Causal or non-causal

iv) Time invariant or time-variant

a) $\frac{d^2y(t)}{dt^2} + 2y(t)\frac{dy(t)}{dt} + 3t y(t) = x(t)$ b) $y(n) = x(n)x(n-2)$

(b) Check whether the following systems are causal or not?

i) $y(t) = x[\sin 2t]$

ii) $y(n) = x(-n)$

(5+5=10)

3. (a) Define signal. Classify elementary signals.

(b) Explain with mathematical expression the unit ramp function.

(6+4=10)

4. (a) What is Fourier series? Write the mathematical expression of trigonometric form of F.S. indicating values of coefficients.

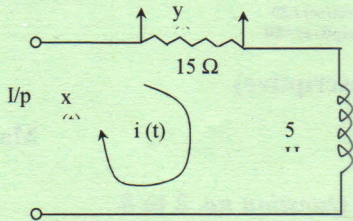
(b) Obtain the Fourier series for the function defined by:

$$f(x) = \begin{cases} x & \text{when } 0 < x < \pi \\ 0 & \text{when } \pi < x < 2\pi \end{cases}$$

(5+5=10)

5. (a) Show that $\zeta\{3e^{-\frac{1}{2}x} \sin^2 x\} = \frac{48}{(2s+1)(4s^2+4s+17)}$

(b) Find the unit step response of the circuit shown below:



(5+5=10)

6. (a) Define Laplace transform. Find the Laplace the transform of

i) $f(t) = \cos at$

ii) $f(t) = t$

(b) Find

(i) $\xi^{-1}\left\{\frac{3}{(s-2)^2+3^2}\right\}$

(ii) $\xi^{-1}\left\{\frac{2(s+1)}{(s+1)^2+3^2}\right\}$

(5+5=10)

7. (a) Find the Laplace's transform of

a) $(6 \sin 3t - 4 \cos 5t)$

b) $(2 \cosh 2\theta - \sinh 3\theta)$

(b) Find whether the following systems are time variant or not:

a) $y(t) = t^2 x(t)$

b) $y(t) = x(-2t)$

(6+4=10)

8. (a) Find the step and impulse response of series R-C circuit.

(b) Verify the initial value theorem for voltage function $(5 + 2 \cos 3t)$ volts and state its initial value.

(10)

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Duration: 20 minutes

Marks – 20

(PART A - Objective Type)

I. Tick the correct answer:

1×20=20

1. $u(t-a)=0$, if
a) $(t-a)=0$ b) $(t-a)<0$ c) $(t-a)>0$ d) $t>a$
2. The fundamental period of a continuous- time complex exponential signal is $T_0 =$
a) 2π b) $\frac{2\pi}{\omega_0}$ c) T d) $2\pi\omega_0$
3. A signal can be represented by
a) time domain b) frequency domain
c) both a) and b) d) none of the above
4. For the Fourier series $f(x) = a_0 + \sum_{n=1}^{\infty} (a_n \cos nx + b_n \sin nx)$, value of a_0 is
a) $a_0 = \int_{-\pi}^{+\pi} f(x) dx$ b) $a_0 = \frac{1}{2\pi} \int_{-\pi}^{+\pi} f(x) dx$
c) $a_0 = \frac{1}{\pi} \int_{-\pi}^{+\pi} f(x) dx$ d) none of the above
5. Laplace transform of the function $f(t)$ is defined by
a) $\int_0^{\infty} e^{-st} f(t) dt$ b) $\int_0^{\infty} e^{st} f(t) dt$
c) $\int_0^{\infty} e^t f(t) dt$ d) both a) and b)
6. Signals can be classified as
a) continuous- time signal b) discrete- time signal
c) both a) and b) d) none of the above
7. If $f(t)=1$, Laplace transform of $f(t)$ i.e. $\zeta\{1\} =$
a) 1 b) $\frac{1}{s}$ c) s d) zero
8. A function is $y = f(x)$ is said to be even if
a) $f(x) = -f(x)$ b) $f(-x) = f(x)$
c) $f(x) = f(x)$ d) all of the above

9. $y = \sin x$ is a
 a) even function b) odd function
 c) both a) and b) d) none of the above
10. Discrete time-signals can be represented by
 a) graphical representation b) tabular representation
 c) functional representation d) all of the above
11. If a signal depends on only one independent variable, it is called a signal of
 a) one dimension b) two dimension
 c) dimensionless d) both a) and b)
12. Unit step function can be obtained by..... the unit impulse function
 a) integrating b) differentiating
 c) both a) and b) d) dividing
13. A signal which cannot be represented by a mathematical equation is called a
 a) periodic signal b) random signal
 c) continuous signal d) both a) and b)
14. A system is a
 a) physical device b) mathematical model
 c) linear model d) ideal device
15. A causal system is one whose output depends onvalues on input.
 a) present and past b) present and future
 c) present d) all of the above
16. Dynamic systems are also called assystem.
 a) memory b) memory less
 c) stable d) unstable
17. A system is an entity that acts on ansignal and transforms it into an..... signal
 a) input, output b) output, input
 c) input, input d) output, output.
18. The inductor L in time domain becomes in s domain.
 a) Ls b) $\frac{1}{Ls}$ c) $\frac{1}{L}$ d) $\frac{1}{s}$
19. Like signals, systems may also be divided as
 a) continuous- time systems b) discrete- time systems
 c) both a) and b) d) variable systems
20. The capacitor C in time domain becomes..... in s domain
 a) $\frac{1}{Cs}$ b) $\frac{1}{s}$ c) $\frac{1}{C}$ d) s
